

STUDYING ABOUT THE ROUGHNESS EFFECT OF TRAILING FLOW OF S823 AIRFOILS

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Abstract The purpose of this paper is comparing and evaluating the effects of roughness on the airfoil trailing S823. A wind tunnel (with max 30 m/s speed and 0.1% turbulence) was used for modeling free stream. The performance studies on airfoil with angles -5, zero and +5 degree and speeds of 5, 10 and 20 meters per second was done. The issue of the flat and rough airfoil was achieved. For making surface rough, airfoil body was covered with standard number 40 rough.

Due to the increasing consumption and demand of electricity in world, the need of researching about improving the ways of producing energy understand. Furthermore, the high efficiency of electricity and the ability of becoming other types of energy are benefits of this kind of energy. As result, we need to get the effect of turbulence on airfoil in order to raise the production efficiency and to achieve new blades with higher performance and require less maintenance. Finally, results of a comparison between smooth and rough in this study shows hard change in trailing.

Keywords Wind tunnel, blade of wind turbine, wind speed, surface roughness, trailing of airfoil

Introduction

So far, many studies have been done on the intensity of turbulence trail bodies. Xiaofeng Liu and his colleagues measured highly turbulent wake of sharp trailing edge of a flat plate under adverse pressure gradients in the wind tunnel [1]. Zhang Qiang and Phillip Ligrani studied about effects on surface roughness and turbulence free flow velocity profiles and turbulence intensity for a given airfoil [2]. Tames Regert et tested turbulent boundary layer profile and its effect on turbulence intensity of the airfoil's RAF6 trailing experimentally at attack angles [3]. C. Sicot and P. Devinant and colleagues in France Reviewed rotation and turbulence effects on wind turbine blades with focusing on evaluating the stall mechanism [4].

The geometry schematic of wind tunnel test is shown in Figure 1.

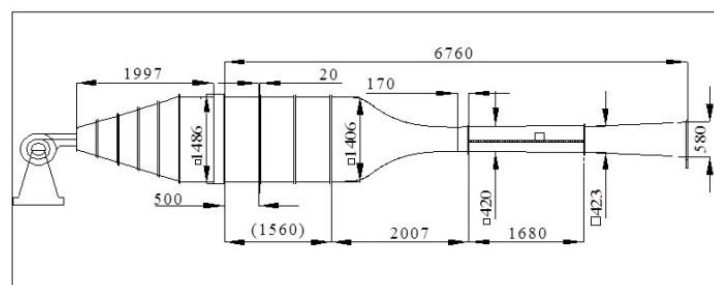


Figure 1. Specification of the wind tunnel of Hakim Sabzevari University

Receiving data have been done at speeds of 5, 10 and 20 meters per second, corresponding to Reynolds numbers 30303, 60606 and 121212. Receive the source data as $Y=0$ in the wake speed diagrams was determined Based on the X-axis is along the trailing edge. Measure was done with angles of attack -5, zero & 5 degree in position

$X / C = 1/100, 1/2, 1, 2, 3$. X is distance from the trailing edge airfoil and C is airfoil chord. Figure 2 experiment Schematic view (which includes an airfoil and its probe with probe movement) shows in the wind tunnel.

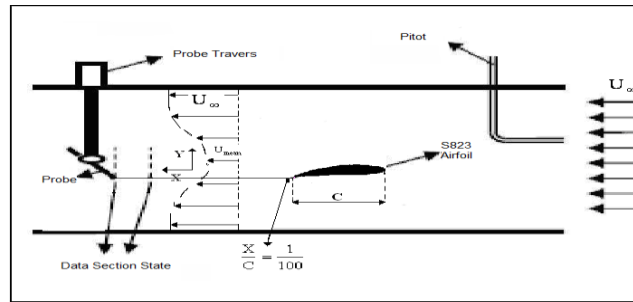


Figure 2. Schematic view of the wind tunnel test

Conclusions

A sample of received data for smooth and rough surfaces in the pictures is presented below.

According to figures above it can be seen that the trail speed of rough mode has extreme changes in contrast the flat mode. These changes included trail spreading and turbulence increasing.

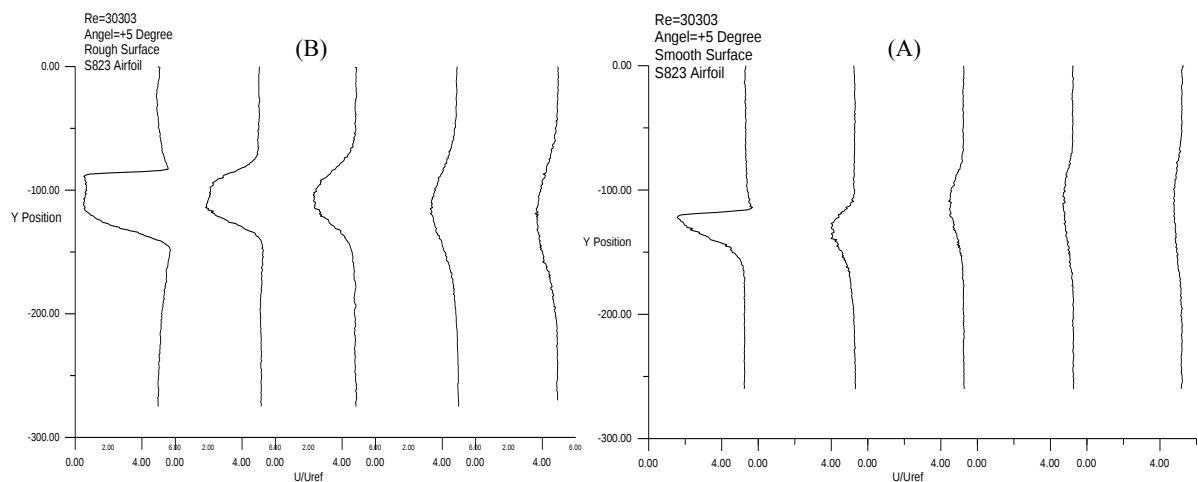


Figure 3. Velocity=5 m/s & angel= +5 degree (A) Smooth surface, (B) Rough surface

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